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An updated checklist of the Cantharidae and Lycidae of Switzerland (Coleoptera, Elateroidea)

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Abstract

An updated checklist of the Swiss species belonging to the families Cantharidae and Lycidae, is presented and briefly discussed. This checklist includes 106 species and is based on over 26'000 occurrences obtained from the identification of specimens held in museum and private collections, as well as from records taken from the literature. *Cantharis liburnica* Depoli, 1912, *C. paradoxa* Hicker, 1960, *Malthinus rubricollis* Baudi di Selve, 1859 and *Malthodes umbrosus* Kiesenwetter, 1871 are recorded from Switzerland for the first time. Two species previously recorded from Switzerland (*Malthodes montanus* Kiesenwetter, 1863, *M. boicus* Kiesenwetter, 1863) are excluded from this list, as those records were based on misidentified material.

Key Words

Insecta, soldier beetles, species list, new country records, faunistics, distribution

Introduction

With more than 5600 described species worldwide (Delkeskamp 1977, Kazantsev and Brancucci 2007), Cantharidae are the tenth most diverse family of Coleoptera. They are soft-bodied, predatory beetles, ranging in size from about 1.0 to roughly 30 mm in some tropical species. Lycidae are a related group comprising roughly 4000 described species worldwide (Bocák and Bocáková 2016), though the vast majority of them are found in the tropics.Their life history and size range is similar to that of Cantharidae. Together, those families form a part of Elateroidea, one of the major clades of the suborder Polyphaga, which has undergone major changes in its family-level classification in recent decades, mostly due to advances in molecular phylogeny (e.g. Bocák et al. 2016). "Soft-bodiedness" (i.e. a weakly sclerotised exoskeleton) has been shown to be a derived character that evolved multiple times independently within Elateroidea. As such, the former grouping "Malacodermata" and "Cantharoidea", which included Cantharidae and Lycidae, have now become obsolete (Kusy et al. 2018, 2020).

Within the fauna of Switzerland, Cantharidae are a moderately diverse and certainly very abundant and commonly recorded family, while Lycidae is represented only by a small handful of mostly uncommon species. The most recent faunistic treatment of these families was provided by Allenspach and Wittmer (1979), which included detailed distribution maps for some of the rarer species, but only rough distributional information for the more common ones. Walter Wittmer (Basel 1915 – Prague 1998), a world expert on Cantharidae, described approximately 3600 species and subspecies (Brancucci 2005), including several new taxa from Switzerland, one of which was published after his faunistic treatment (Wittmer 1981).

Allenspach and Wittmer (1979) also included the two small families Omalisidae and Drilidae, neither of which is currently recognised as valid after recent phylogenetic studies showed them to be derived members of Elateridae (Kundrata and Bocák 2011, Kusy et al. 2018). For the Swiss fauna, Omalisinae is only represented by *Omalisus fontisbellaquaei* (Geoffroy in Fourcroy, 1785) while Drilini (now part of Elateridae: Agrypninae) includes the two

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species *Drilus flavescens* (Geoffroy in Fourcroy, 1785) and *D. concolor* Ahrens, 1812. These three species are widespread and well-documented within Switzerland, so no faunistic update is needed for them. The Swiss fauna of Lampyridae, another closely related elateroid family, was recently treated by Gurcel et al. (2020), while the morphologically similar (but unrelated) families Melyridae and Rhadalidae (of superfamily Cleroidea) were updated by Chittaro and Sanchez (2019b). Although our understanding of the beetle fauna of Switzerland has greatly improved since the publication of Allenspach and Wittmer (1979), many groups are still in urgent need of attention. For example, several species found in Switzerland and published since 1979 must be added to the list (e.g. Scherler 1981, Walter and Weber 1999, Kopetz and Duelli 2006), while other species that were recorded from Switzerland based on unreliably labelled material should be excluded. Furthermore, updates are urgently required for the many nomenclatural changes to the Swiss fauna, as well as for the distribution of certain species in Switzerland. Using Allenspach and Wittmer (1979) as a foundation, our objective is to update the Swiss checklist for Cantharidae and Lycidae, to add new data and to flag problems when needed.

Material and methods

The goal of this study was to evaluate all existing information in order to present a complete list of the Swiss fauna. We therefore performed an exhaustive examination of the relevant material present in major Swiss museum collections, as was recently done for other beetle groups (see for exemple Chittaro and Sanchez 2019a, 2019b, Sanchez et al. 2020). The collections in the following museums were studied (the contact person is reported in parentheses after each institution):

AGRO Agroscope-Changins, Nyon (Stève Breitenmoser);
BNM Bündner Natur-Museum, Chur (Stephan Liersch);
ETH Eidgenössische-Technische Hochschule, Zürich (Michael Greeff);
KMLI Archäologie und Museum Baselland, Liestal (Marc Limat);
MHNF Musée d'histoire naturelle de Fribourg (Peter Wandeler, Sophie Giriens);
MHNG Muséum d'histoire naturelle de Genève (Giulio Cuccodoro);
MHNN Musée d'histoire naturelle de Neuchâtel (Jessica Litman);
MHNS Musée de la nature du Valais, Sion (Sonja Gerber);
MSNL Museo cantonale di storia naturale, Lugano (Lucia Pollini Paltrinieri);
MZL Musée cantonal de zoologie, Lausanne (Anne Freitag);
MZA Museum zu Allerheiligen, Schaffhausen (Urs Weibel);
NMAA Naturama, Aarau (Janine Mazenauer);
NMB Naturhistorisches Museum Basel (Matthias Borer);
NMBE Naturhistorisches Museum Bern (Hannes Baur);
NMLU Natur-Museum, Luzern (Marco Bernasconi, Peter Herger);
NMSG Naturmuseum St. Gallen (Karin Urfer);
NMTG Naturmuseum Thurgau, Frauenfeld (Barbara Richner);
NMSO Naturmuseum, Solothurn (Marc Neumann).

We also cite data gathered from two museums outside Switzerland:

BMNH Natural History Museum, London, United Kingdom;
SMNS Staatlichen Museum für Naturkunde Stuttgart, Germany.

Moreover, we included data from the private collections of the authors, as well as those of the following individuals: Stève Breitenmoser (Givrins VD), Vivien Cosandey (Essertines-sur-Rolle VD), Berndt Eismann (Kreuzlingen TG), Bastien Guibert (Gy GE), Roman Graf (Horw LU), Barbara Huber (Thusis GR), Christian Monnerat (Neuchâtel NE), Wolfgang Pankow (Dogern, Germany) and Arnaud Vallat (Bienne BE).

All available data from the literature relevant for Switzerland were also considered. The references from these publications are included in the bibliography. Literature not explicitly cited is supplied as Suppl. material (see Suppl. material 1: File S1).

Nomenclature and systematics followed are those of the "Catalogue of Palaearctic Coleoptera" (Kasantsev and Brancucci 2007, Bocáková and Bocák 2007), with the following exceptions:

- The valid name for *Ancistronycha violacea* (Paykull, 1798) should be *A. tigurina* (Dietrich, 1857), following Silfverberg (2010).
- *Malthodes icaricus* Wittmer, 1940 is now a separate species and no longer a subspecies of *M. penninus* (Liberti 2015).
- *Malthodes lucernensis*, described by Wittmer (1981) from Switzerland, was recently synonymised with *M. maurus* by Liberti (2016): the examination of a large amount of material suggests indeed that *M. lucernensis* is simply an "extreme" morphological form of *M. maurus*, usually found sympatrically.
- *Malthodes transeuropaeus* Wittmer, 1970 was synonymised with *M. europaeus* by Liberti (2015).
- The subspecies *Malthodes trifurcatus atramentarius* Kiesenwetter, 1852 is here treated as synonymous with *M. trifurcatus*, following Liberti (2017). Those two morphological forms (with the last abdominal segments more or less developed in the male) are often found together in the same localities or the same general area.
- *Crudosilis ruficollis* (Fabricius, 1775) is in fact the type species of *Silis* Charpentier, 1825. As such, the name was changed back to *Silis ruficollis*, according to Kazantsev (2011).

- *Silis nitidula* (Fabricius, 1792) is now a member of the genus *Autosilis*, following Kazantsev (2011).

The specimens were identified using the following publications: Geisthardt (1979, 1992), Dahlgren (1968, 1979), Wittmer (1979), Liberti (2011, 2015, 2016, 2017, 2018), Švihla (2006), Constantin (2014c), Bretzendorfer (2010, 2017) and Kazantsev (2005).

When not otherwise specified, general information on species' distributions are taken from the "Catalogue of Palaearctic Coleoptera" (Kasantsev and Brancucci 2007, Bocáková and Bocák 2007).

We have also used the relevant literature concerning the countries and regions adjacent to Switzerland, such as Fanti (2014) for Italy and the regional treatment of Kahlen and Hellrigl (1996) for South Tyrol / Alto Adige, Constantin (2014a, b, c) for France and regionally Callot (2018) for Alsace, Köhler and Klausnitzer (1998) and Köhler (2000, 2011) for Germany, as well as the regional treatment of Bretzendorfer (2017) for south-western Germany, and Brandstetter and Kapp (1998) for Vorarlberg (Austria) and Liechtenstein.

The list of the main synonyms of each taxon is provided in "Catalogue of Palaearctic Coleoptera" (Löbl and Smetana 2007) and is therefore not reported here. The subfamily and tribal classifications adopted here follow Bouchard et al. (2011), which is based upon the morphological phylogenetic study by Brancucci (1980).

Once an exhaustive list of species was compiled, we followed the procedure proposed by Monnerat et al. (2015) in order to assess which of these species should be considered indigenous to Switzerland. We only retained species whose relative data were deemed sufficient (unambiguous labeling, reliable collections, etc.) for inclusion on the national checklist.

Those species whose presence in Switzerland is substantiated by less than twenty valid observations are subject to an additional comment. In these cases, species names in the table are followed by a letter and a number in bold ("**C1**" for example) and all the examined specimens and published observations are mentioned in order to document and justify the presence of these species on the checklist. When not otherwise specified, all examined material was identified or reviewed by the authors.

There are various genera and species groups in Cantharidae for which the only known reliable characters are the male terminalia. For those species, only dissected males are counted as "verified" records, while records based exclusively upon female specimens were omitted as unverifiable.

The specimens and literature-based records presented here are listed in chronological order of discovery (or publication date) and then in alphabetical order by locality, depending on available information. All occurrences are cited according to the following scheme: number of specimens, locality (pre-2000 data) or municipality and abbreviated canton (post-2000 data), date, collector, determinator (in the case that the determinator was not one of the authors), collection and official acronym of the institution where the insect is deposited.

Information about localities and dates are reported as found on the labels. Interpretations of alphabetical abbreviations are placed within square brackets ("[ ]"). In old collections, the collector (leg.) is not always explicitly labelled. In such cases, we favored the « coll. » tag. In some cases, the original collection holder was not labelled but we were nonetheless able to identify the source of the collection based on type labels and/or handwriting.

The Charles Maerky collection, held by the Natural History Museum of Geneva, has long been considered problematic (Monnerat et al. 2015). In addition to specimens coming from his personal collection ("coll. Maerky C."), it also contains insects from other sources (labelled, for instance, as "ex coll. Melly A.") but lacking any original labels. In such cases, we maintained the "coll. Maerky C." mention for his whole collection to ensure the association of these samples with the Maerky C. collection.

For the literature-based data, detailed under "Published data", we retained the locality as it appeared in the original citation. We consider the "source" of the records to be the author of the publication, for example: "Ormontsthal by Venetz I. (Stierlin and Gautard 1867)". If the same records have been published more than once, then only the oldest publication is retained, given that localities in later publications are often altered and sometimes truncated. Under the heading "Published data" we avoided repeating the data reported in Allenspach and Wittmer (1979) when the relevant specimens they cite have been examined and their old determinations verified; these data already appear under "Examined material". On the other hand, we report in full the Allenspach and Wittmer (1979) data for which the corresponding material was not located or in the case where the original identification was deemed to be erroneous. Among the data cited in this paper under "Examined material" or "Published data", we inserted a superscript number code before those entries we considered insufficiently documented to be retained, using the following code to describe error type (following Monnerat et al. 2015). Thus if one of the following eight criteria is fulfilled, a record is considered as doubtful:

1. data source cannot be verified;
2. incorrect identification;
3. specimen from problematic collection;
4. specimen of unknown origin but attributed to a Swiss locality;
5. double labeling, original locality misinterpreted or incorrectly copied;
6. confusion between localities: original finding, breeding or hatching place and collection storage site;
7. non-Swiss localities or potentially Swiss localities that share their names with foreign place names (and thus of dubious Swiss origin);
8. chorological or ecological inconsistencies.

Abbreviations used: coll. = collection, det. = determinator, ex. = specimen, leg. = collector. Abbreviated Swiss cantons (only cantons cited in the text): AG = Aargau,

BE = Bern, BL = Basel-Landschaft, FR = Fribourg, GE = Geneva, GR = Grisons, LU = Lucerne, NE = Neuchâtel, SH = Schaffhausen, SZ = Schwyz, TI = Ticino, TG = Thurgau, VD = Vaud, VS = Valais, ZH = Zurich.

Results

Swiss fauna Cantharidae and Lycidae list

We consider that the 106 species (107 taxa) listed in bold and without square brackets "[ ]" either currently do or formerly did form populations in Switzerland, even if only scant information is available for many of them.

On the other hand, the seven species listed in square brackets "[ ]" should not be considered as belonging to the Swiss fauna, until new data show otherwise. In this category, we placed species whose individuals come from problematic collections, such as Charles Maerky's or Max Täschler's (Monnerat et al. 2015), those that were erroneously mentioned for Switzerland due to incorrect identifications and those cited in old publications, like Stierlin and Gautard (1867), without reference to specific individuals and consequently considered as doubtful. Other species may eventually be found in the Swiss territory but currently available data are not sufficient to confirm their establishment in Switzerland.

A special problem is presented by the four species of *Hapaloderus* (now *Malthodes*) described by Motschulsky (1853) from Switzerland: *Hapaloderus alpinus* (described from "Suisse orientâle [sic!]" (eastern Switzerland) and "Koschutna in Carniolia" (Košutna planina) in today's Slovenia), *H. angusticollis* (described from "Alpes de la Suisse (Appenzell)"), *H. croceicollis* (described from "Switzerland", as well as "Saxe, dans l'Odewalder Ground près de St. Wählen", probably Uttewalder Grund near Stadt Wehlen in Saxony, Germany) and *H. ventralis* (described from "Berne" (Switzerland) and "Styrie" in Austria). The descriptions of these species are insufficient and are not accompanied by illustrations, thus making it impossible to recognise the species and match them with currently accepted *Malthodes* names (Liberti 2015). Whether or not the type material is still in good enough condition to be examined cannot be said at the moment, but it seems questionable for at least part of them (see Kazantsev and Nikitsky 2008), also considering the fact that most *Malthodes* are only identifiable from the male terminalia, so females are often unrecognisable. Those species have been excluded from the Swiss checklist by Allenspach and Wittmer (1979) for the reason of being "incertae sedis". Kazantsev and Brancucci (2007), however, listed them as valid. Without access to Motschulsky's type material we are currently not able to address the taxonomic status of those four names. But as no author has ever been able to interpret them and match them with an actual valid *Malthodes* species, we decided to omit them from the present checklist, pending further taxonomic studies.

To facilitate the species' search in this document, taxa appear in alphabetical order for families, subfamilies, tribes, genera, subgenera, species and subspecies.

All collected information represent 26'208 occurrences within the concerned families. Updated distribution maps of these species are available on the info fauna – CSCF cartographic server (http://lepus.unine.ch/carto/). All the valid data are also available in http://www.GBIF.org (https://doi.org/10.15468/dl.ngkguj).

CANTHARIDAE

Cantharinae Imhoff, 1856

Cantharini Imhoff, 1856

***Ancistronycha abdominalis* (Fabricius, 1798)**
***Ancistronycha erichsonii erichsonii* (Bach, 1852)**
[*Ancistronycha occipitalis* (Rosenhauer, 1847)] **C1**
***Ancistronycha tigurina* (Dietrich, 1857)**
***Cantharis* (*Cantharis*) *annularis* Ménétriés, 1836**
***Cantharis* (*Cantharis*) *cryptica* Ashe, 1947**
***Cantharis* (*Cantharis*) *decipiens* Baudi di Selve, 1872**
***Cantharis* (*Cantharis*) *figurata* Mannerheim, 1843**
***Cantharis* (*Cantharis*) *flavilabris* Fallén, 1807**
***Cantharis* (*Cantharis*) *fusca* Linnaeus, 1758**
***Cantharis* (*Cantharis*) *livida* Linnaeus, 1758**
***Cantharis* (*Cantharis*) *liburnica* Depoli, 1912 C2**
***Cantharis* (*Cantharis*) *montana* Stierlin, 1889**
***Cantharis* (*Cantharis*) *nigra* (DeGeer, 1774)**
***Cantharis* (*Cantharis*) *nigricans* (O. F. Müller, 1776)**
***Cantharis* (*Cantharis*) *obscura* Linnaeus, 1758**
***Cantharis* (*Cantharis*) *pallida* Goeze, 1777**
***Cantharis* (*Cantharis*) *paludosa* Fallén, 1807**
***Cantharis* (*Cantharis*) *paradoxa* Hicker, 1960 C3**
***Cantharis* (*Cantharis*) *pellucida* Fabricius, 1792**
***Cantharis* (*Cantharis*) *pulicaria* Fabricius, 1781**
***Cantharis* (*Cantharis*) *quadripunctata* (O. F. Müller, 1776) C4**
***Cantharis* (*Cantharis*) *rufa* Linnaeus, 1758**
***Cantharis* (*Cantharis*) *rustica* Fallén, 1807**
***Cantharis* (*Cantharis*) *terminata* Faldermann, 1835**
***Cantharis* (*Cantharis*) *tristis* Fabricius, 1798**
***Cantharis* (*Cyrtomoptila*) *fibulata* Märkel, 1852**
***Cantharis* (*Cyrtomoptila*) *gemina* Dahlgren, 1974**
***Cantharis* (*Cyrtomoptila*) *lateralis* Linnaeus, 1758**
***Cantharis* (*Cyrtomoptila*) *pagana* Rosenhauer, 1847 C5**
***Cratosilis denticollis* (Schummel, 1844)**
***Cratosilis distinguenda* (Baudi di Selve, 1859)**
***Cratosilis laeta* (Fabricius, 1792)**
***Metacantharis clypeata* Illiger, 1798**
***Metacantharis discoidea* (Ahrens, 1812)**
***Podistra* (*Absidia*) *rufotestacea* (Letzner, 1845)**
***Podistra* (*Absidia*) *schoenherri* (Dejean, 1836)**
***Podistra* (*Pseudoabsidia*) *prolixa* (Märkel, 1852)**
***Rhagonycha* (*Rhagonycha*) *atra* (Linnaeus, 1767)**

***Rhagonycha* (*Rhagonycha*) *elongata* (Fallén, 1807) C6**
[*Rhagonycha* (*Rhagonycha*) *femoralis* (Brullé, 1832)] **C7**
***Rhagonycha* (*Rhagonycha*) *fugax fugax* Mannerheim, 1843**
***Rhagonycha* (*Rhagonycha*) *fulva* (Scopoli, 1763)**
***Rhagonycha* (*Rhagonycha*) *fuscitibia* Rey, 1891**
***Rhagonycha* (*Rhagonycha*) *gallica* Pic, 1923**
***Rhagonycha* (*Rhagonycha*) *lignosa* (O. F. Müller, 1764)**
***Rhagonycha* (*Rhagonycha*) *lutea* (O. F. Müller, 1764)**
***Rhagonycha* (*Rhagonycha*) *maculicollis* Märkel, 1852**
***Rhagonycha* (*Rhagonycha*) *nigriceps* (Waltl, 1838)**
***Rhagonycha* (*Rhagonycha*) *nigripes* (W. Redtenbacher, 1842)**
***Rhagonycha* (*Rhagonycha*) *nigriventris* Motschulsky, 1860**
***Rhagonycha* (*Rhagonycha*) *pedemontana* Baudi di Selve 1872 C8**
***Rhagonycha* (*Rhagonycha*) *testacea* (Linnaeus, 1758)**
***Rhagonycha* (*Rhagonycha*) *translucida* (Krynicki, 1832)**

Podabrini Gistel, 1856

***Podabrus alpinus* (Paykull, 1798)**

Malthininae Kiesenwetter, 1852

Malthinini Kiesenwetter, 1852

***Malthinus* (*Malthinus*) *balteatus* Suffrian, 1851**
***Malthinus* (*Malthinus*) *biguttatus* (Linnaeus, 1758)**
***Malthinus* (*Malthinus*) *bilineatus* Kiesenwetter, 1852 C9**
***Malthinus* (*Malthinus*) *facialis* C. G. Thomson, 1864**
***Malthinus* (*Malthinus*) *fasciatus* (A. G. Olivier, 1790)**
***Malthinus* (*Malthinus*) *flaveolus* (Herbst, 1786)**
***Malthinus* (*Malthinus*) *frontalis* (Marsham, 1802)**
***Malthinus* (*Malthinus*) *glabellus* Kiesenwetter, 1852**
***Malthinus* (*Malthinus*) *rubricollis* Baudi di Selve, 1859 C10**
***Malthinus* (*Malthinus*) *seriepunctatus* Kiesenwetter, 1852**
***Malthinus* (*Malthinus*) *sordidus sordidus* Kiesenwetter, 1871 C11**

Malthodini Böving & Craighead, 1931

***Malthodes* (*Malthodes*) *aemulus* Kiesenwetter, 1861 C12**
***Malthodes* (*Malthodes*) *alpicola* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *bertolinii* Fiori, 1905 C13**
[*Malthodes* (*Malthodes*) *bifurcatus* Kiesenwetter, 1852] **C14**
[*Malthodes* (*Malthodes*) *boicus* Kiesenwetter, 1863] **C15**
***Malthodes* (*Malthodes*) *brevicollis* (Paykull, 1798)**
***Malthodes* (*Malthodes*) *caudatus* J. Weise, 1892 C16**
***Malthodes* (*Malthodes*) *crassicornis* (Maeklin, 1846) C17**
***Malthodes* (*Malthodes*) *cyphonurus* Kiesenwetter, 1861**
***Malthodes* (*Malthodes*) *debilis debilis* Kiesenwetter, 1852 C18**
[*Malthodes* (*Malthodes*) *dimidiaticollis dimidiaticollis* (Rosenhauer 1847)] **C19**
***Malthodes* (*Malthodes*) *dispar* (Germar, 1824)**
***Malthodes* (*Malthodes*) *europaeus* Wittmer, 1970**
***Malthodes* (*Malthodes*) *facetus* Kiesenwetter, 1863 C20**
***Malthodes* (*Malthodes*) *fibulatus* Kiesenwetter, 1852 C21**
***Malthodes* (*Malthodes*) *flavoguttatus* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *fuscus* (Waltl, 1838)**
***Malthodes* (*Malthodes*) *guttifer* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *hexacanthus* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *holdhausi* Kaszab, 1955 C22**
***Malthodes* (*Malthodes*) *icaricus* Wittmer, 1940 C23**
***Malthodes* (*Malthodes*) *kahleni* Wittmer, 1982 C24**
***Malthodes* (*Malthodes*) *lobatus* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *marginatus* (Latreille, 1806)**
***Malthodes* (*Malthodes*) *maurus* (Laporte, 1840)**
***Malthodes* (*Malthodes*) *minimus* (Linnaeus, 1758)**
***Malthodes* (*Malthodes*) *misellus* Kiesenwetter, 1852**
[*Malthodes* (*Malthodes*) *montanus* Kiesenwetter, 1863] **C25**
***Malthodes* (*Malthodes*) *mysticus mysticus* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *penninus penninus* Baudi di Selve, 1872**
***Malthodes* (*Malthodes*) *penninus raeticus* Wittmer, 1970 C26**
***Malthodes* (*Malthodes*) *pumilus* (Brébisson, 1835)**
***Malthodes* (*Malthodes*) *setifer* Baudi di Selve, 1871**
***Malthodes* (*Malthodes*) *siculus* Kiesenwetter, 1852 C27**
***Malthodes* (*Malthodes*) *spathifer* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *spretus* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *stolzi* Hicker, 1915] C28**
***Malthodes* (*Malthodes*) *trifurcatus* Kiesenwetter, 1852**
***Malthodes* (*Malthodes*) *umbrosus* Kiesenwetter, 1871 C29**
***Malthodes* (*Malthodes*) *vincens* Gredler, 1870 C30**

Silinae Mulsant, 1862

Silini Mulsant, 1862

[*Autosilis nitidula* (Fabricius, 1792)] **C31**
***Silis ruficollis* (Fabricius, 1775)**

LYCIDAE

Lycinae Laporte, 1836

Calochromini Lacordaire, 1857

***Lygistopterus sanguineus sanguineus* (Linnaeus, 1758)**

Erotini LeConte, 1881

***Dictyoptera aurora* (Herbst, 1784)**
***Erotides* (*Glabroplatycis*) *cosnardi* (Chevrolat, 1831)**
***Lopheros* (*Lopheros*) *rubens* (Gyllenhal, 1817)**
***Platycis* (*Platycis*) *minutus* (Fabricius, 1787)**
***Pyropterus nigroruber* (DeGeer, 1774)**

Commented species

C1) [*Ancistronycha occipitalis* (Rosenhauer, 1847)]

Published data. [1)]Panix and [1)]Savien by Frey-Gessner E. (Caflisch 1894).

Comment. While the above literature citation is not verifiable, all of the male specimens examined from various Swiss collections standing as *A. abdominalis* "a. *occipitalis*" or "var. *occipitalis*" turned out to be either *A. abdominalis* or *A. tigurina* after dissection. We were unable to find a single *A. occipitalis* among them. This species is therefore not confirmed for Switzerland, despite being present in Central and eastern Europe and also from the South-West of Germany (Bretzendorfer 2017). It is therefore possible that *A. occipitalis* may be found in northern Switzerland in the future.

C2) *Cantharis* (*Cantharis*) *liburnica* Depoli, 1912

Examined material. [3)]1 ex., Alpes, Mendrisio, coll. Maerky C., MHNG; 1 ex., Mendrisio, 25.IV., leg. Anonymous, MHNG.

Comment. Widely distributed in southern and western Europe, this species is newly recorded here for the Swiss fauna based on the above mentioned specimen from Mendrisio (25.IV.), despite the lack of a precise date and collector. Its occurrence in the extreme south of Ticino can be seen as a continuation of its range in northern Italy (Moscardini 1963, Fanti 2014). The first specimen cited here belongs to the « problematic » collection of C. Maerky (see Monnerat et al. 2015) and is therefore not retained as a valid record.

C3) *Cantharis* (*Cantharis*) *paradoxa* Hicker, 1960

Examined material. 1 ex., Bâle, V., leg. Toumayeff G., MHNG; 2 ex., Soloth. Jura, Hofst. K., 22.V.1949, leg. & coll. Wolf J.-P., ETH; 1 ex., U. Stierenwald BL, V.1954, leg. Toumayeff G., MHNG; [1)]1 ex., Stein a. Rhein, 20.V.1982, leg. Köstlin R., det. Bouwer R, SMNS.

Comment. This species is widespread in Europe from the Netherlands to Greece. It is rather similar to *C. obscura* based on external characters but the male genitalia are clearly different. For Switzerland, we have only found a small number of males that can be definitely assigned to this species, all from the north of the country, as a continuation of its range in southern Germany (Bretzendorfer 2017). *Cantharis obscura*, on the other hand, was found to be widespread throughout Switzerland. *Cantharis paradoxa* was also recently discovered in Alsace, at low altitude (Callot 2011). It must, however, still be confirmed for Italy (Fanti 2014).

C4) *Cantharis* (*Cantharis*) *quadripunctata* (O. F. Müller, 1776)

Examined material. 1 ex., Valsot GR, 23.VI.2017, leg & coll. Chittaro Y.

Published data. Numerous citations in the older literature, partly repeated and added to by Allenspach and Wittmer (1979). None of those records are reliable, as none of them are based on dissected male specimens and may refer to either *C. quadripunctata* or *C. montana* (see below). We are therefore not repeating those citations here.

Comment. A systematic study of all the males of the *C. quadripunctata*/*C. montana* species complex present in Swiss collections revealed that all of them belong to *C. montana*, based on the shape of their laterophyses (Fig. 1B, E). To our knowledge, only a single specimen (Fig. 1A, B) recently caught in far eastern Grisons confirms the occurrence of *C. quadripunctata* in Switzerland (Fig. 1C), while *C. montana* is not very common, but widespread in various regions of the country (Fig. 1F). *Cantharis quadripunctata* has extremely variable colouration, making it easy to confuse with other species in the field. Bretzendorfer (2017) considered it a rare and endangered species in Baden-Württemberg, but listed several localities in the south of that region close to the Swiss border. Fanti (2014) recorded it from northern Italy. It is therefore likely that *C. quadripunctata* can also be expected in other regions of Switzerland, both in the north and the south of the country.

C5) *Cantharis* (*Cyrtomoptila*) *pagana* Rosenhauer, 1847

Examined material. 1 ex. Kt. S. Gallen, Wildhaus, VI.1936, leg. & coll. Linder A., ETH; 1 ex., Bölchen (Olten), 21.VI.1936, leg & coll. Wittmer W., NMB; 1 ex., Meilen, Zch., 30.V.1937, leg & coll. Wittmer W., NMB; 1 ex., Kt. Bern, Uettligen, V.1942, leg. & coll. Linder A., ETH; 1 ex., Sattel SZ, 25.V.1958, leg & coll. Wittmer W., NMB; 1 ex., Villigen AG, 15.VI.1958, leg & coll. Wittmer W., NMB.

Published data. There are numerous records across the literature, but due to the difficult identification and recent taxonomic splits within the subgenus *Cyrtomoptila*, they are mostly unusable now, so we are not citing them here.

Comment. As pointed out by Constantin (2014), *Cantharis pagana* and *C. fibulata* had been recognised as separate species in much of the older literature until 1974. Then, however, Wittmer (1974) synonymised those two closely related species based on a rather superficial examination of their male genitalia. Švihla (2006) has correctly re-validated *C. fibulata* as a separate species. While Švihla (2006) confirms the presence of *C. fibulata* in Switzerland, he indicates the occurrence of *C. pagana* in Switzerland as in need of confirmation. The dissection of numerous males of this difficult group allows us to confirm the presence of both *C. fibulata* and *C. pagana* in Switzerland, with *C. pagana* being the less common of the two. *C. pagana* is known mainly from the northern part of the country, as a continuation of its range in southwest Germany (Bretzendorfer 2017), while *C. fibulata* is primarily found in the Alps, just like the third species of this group, *C. gemina*.

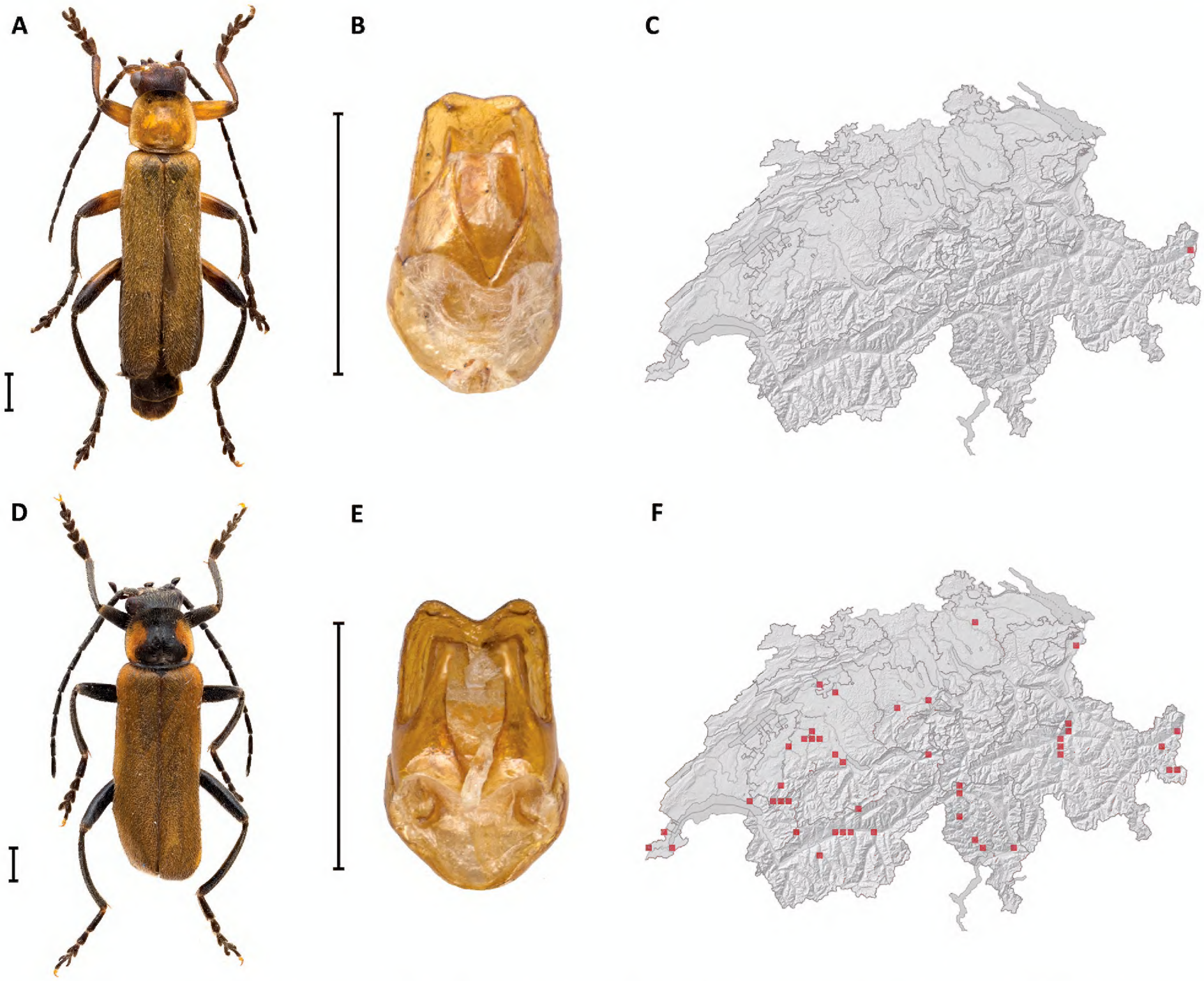

Figure 1. A) Habitus, **B)** aedeagus in ventral view, **C)** Swiss distribution of *Cantharis quadripunctata* (illustrated individual from Valsot GR); **D)** habitus, **E)** aedeagus in ventral view, **F)** Swiss distribution of *Cantharis montana* (illustrated individual from Russin GE). Only verified records based on male specimens were included in the distribution maps. Scale bar: 1 mm. (Photos by L. Magnin).

C6) *Rhagonycha* (*Rhagonycha*) *elongata* (Fallén, 1807)

Examined material. 1 ex., Vals, coll. Huguenin G., ETH; 4 ex., Chasseral, 22.VI.1896, coll. Wittmer W., ex coll. Rätzer A., NMB; 1 ex., Chasseral, 12.VI.1899, coll. Rätzer A., NMBE; 1 ex., Kt. Bern, Meinisberg, 2.IV.1939, leg. & coll. Pochon H., MHNF; 3 ex., Kt. Bern, Tramelan, VII.1939, leg. Linder A., ETH & NMB; 1 ex., Il Fuorn, 18.VII.1950, leg. & coll. Handschin E., BNM; 6 ex., Kt. Neuenburg, La Brévine, VI.1963, leg. Linder A., ETH & NMB; 3 ex., B. Finges VS, V.1969, leg. Toumayeff G., MHNG; 3 ex., Jura VD, Le Brassus, VI.1971, leg. Toumayeff G., MHNG; 28 ex., Le Chenit VD, 18.VI.2021, leg. & coll. Chittaro Y.

Published data. Several citations exist in the literature prior to Allenspach and Wittmer (1979), but these cannot be regarded as reliable since they were not based on dissected males (see below) and are therefore omitted here.

Comment. Even though this species was frequently recorded from Switzerland in the old literature, only a small number of records can be reliably assigned to this species, confirming the presence of a few scattered populations within the country. After 50 years without a single observation, this species was discovered in great numbers in Switzerland in 2021, by beating blossoming pine trees in a peat bog. For reliable identification, it is important to study the male genitalia, distinguishing it from the closely related *R. atra* and *R. gallica*. A number of older records are therefore uncertain. The published records from Baden-Würrtemberg all turned out to be wrong (Bretzendorfer 2010). The occurrence of this species from northern Italy is indicated as dubious (Fanti 2014) and there are no records from France (Constantin 2014a).

C7) [*Rhagonycha* (*Rhagonycha*) *femoralis* (Brullé, 1832)]

Published data. There are numerous citations in the older Swiss literature, but those were already indicated as wrong by Allenspach and Wittmer (1979) and are therefore not repeated here.

Comment. Allenspach and Wittmer (1979) already indicated that the specimens identified as *R. femoralis*

in Swiss collections, as well as all the literature records, refer to *R. improvisa* (currently *R. fuscitibia*), a species described only a few years before by Dahlgren (1976). The « true » *R. femoralis* is a species from Greece and the Balkans, not found in Switzerland.

C8) *Rhagonycha* (*Rhagonycha*) *pedemontana* Baudi di Selve 1872

Examined material. 1 ex., Camoghe, TI, VIII.1963, leg. & coll. Toumayeff G., MHNG; 8 ex., Bellinzona TI, Corno Gesero, 16.VI.2006, leg. Liberti G., coll. Liberti G. & Chittaro Y.

Published data. 1 ex., Wallis, Binntal, 1953, coll. Lindberg, Zoologisches Museum, Helsingfors (Dahlgren 1968).

Comment. This species from the southwestern Alps is only known from very few Swiss specimens, a male identified and cited by Dahlgren (1968) and several other specimens collected by G. Toumayff and G. Liberti in Ticino. Constantin (2014a) cites it from the western French Alps, from the Savoie until the Maritime Alps. In Italy, Fanti (2014) cites it exclusively from the North-West (Piedmont and Aosta Valley), where it is rather localised and uncommon. Additional surveying in the Valais, particularly on the south side of the Simplon and in northwestern Tessin may yield additional data on this species. *Rhagonycha pedemontana* is closely related to *R. maculicollis*, so the identifications should always be confirmed through examining the male parameres (particularly long and slender in *R. pedemontana*).

C9) *Malthinus* (*Malthinus*) *bilineatus* Kiesenwetter, 1852

Examined material. 1 ex., Chambrelien, 12.VII.1949, leg. Anonymous, MHNG; 2 ex., Vaud, Buchillon, 30.VI.1951, leg. Besuchet C., MZL; 2 ex., Tessin, Rovio, 29.VII.1973, leg. & coll. Scherler P., NMBE; 1 ex., Vaud, Moiry, 18.VIII.1984, leg. & coll. Scherler P., NMBE; 3 ex., Meride TI, Serpiano, Wald, 21.VII.1995, 21.VII.1996, 11.VIII.1996, leg. Rezbanyai-Reser L., NMLU; 1 ex., Péry BE, 28.VI.–19.VII.2018, leg. & coll. Chittaro Y.

Published data. Bois de Chênes, Ferreyres-Moiry, 18.VIII.1984 by Scherler P. (Scherler et al. 1989); [1)]Naturschutzgebiet Wildenstein BL, 2000 by Walter Thomas (Walter et al. 2003).

Comment. This species was only recorded from two Swiss localities (Buchillon and Rovio) by Allenspach and Wittmer (1979). Since that publication, some additional data allowed us to get a better picture of the distribution of this rare species. It is restricted to the southern Ticino and a few thermophilous localities of the Swiss plateau and the Jura. It is also present in the Centre and South of France (Constantin 2014a), northern Italy (Fanti 2014), but only known from a single record in Germany (Bretzendorfer 2017). The Palaearctic catalogue (Kazantsev and Brancucci 2007) also indicate it as present in Belgium and Luxemburg.

C10) *Malthinus* (*Malthinus*) *rubricollis* Baudi di Selve, 1859

Examined material. 1 ex., Suisse, Genève, Avully, 10.V.1993, leg. Besuchet C., MHNG; 1 ex., Suisse, Genève, Avully, 16.VI.1993, leg. Besuchet C., MHNG; 2 ex., Suisse, Genève, Avully, 29.VI.1994, leg. Besuchet C., MHNG.

Comment. This southern European species is known from certain regions of France, most notably around Lyon (Constantin 2014a). The above data from Geneva are therefore a continuation of its range in France. It is rare in Italy and only cited from the centre and the north (Fanti 2014) and from South Tyrol/Alto Adige (Kahlen and Hellrigl 1996), where it is, however, considered extinct. Further, there are also records from Croatia, Bulgaria, Greece, Tunisia and Syria (Kazantsev and Brancucci 2007). The two specimens from Geneva from 1993 were collected "on a pile of dead wood", while the two specimens from 1994 were collected while sweeping at the same locality.

C11) *Malthinus* (*Malthinus*) *sordidus sordidus* Kiesenwetter, 1871

Examined material. 1 ex., Astano TI, 14.VII.1977, leg. & coll. Scherler P., NMBE; 1 ex., Castel S. Pietro TI, 29.VI.1984, leg. & coll. Scherler P., NMBE; 1 ex., Lugano TI, Mte Brè-Ost, 1.VIII.1984, leg. Rezbanyai-Reser L., NMLU; 1 ex., Meride TI, San Antonio, 21.–30.VII.1991, leg. Rezbanyai-Reser L., NMLU; 2 ex., Meride TI, Serpiano, 1.–10.VII.1995, leg. Rezbanyai-Reser L., NMLU; 1 ex., Vico Morcote TI, 1.VII.2013, leg. & coll. Chittaro Y.; 1 ex., Centovalli TI, 5.–13.VII.2017, leg. Pollini L., coll. Chittaro Y.; 2 ex., Centovalli TI, 20.VI.–4.VII.2018, leg. Pollini L., coll. Chittaro Y.; 1 ex., Losone TI, 5.–20.VI.2018, leg. Pollini L., coll. Chittaro Y.

Published data. 13 ex., Bosco di Maia TI, 2002–2004 by WSL (Kopetz and Duelli 2006); 1 ex., Vico Morcote TI, 1.VII.2013 by Chittaro Y. (Chittaro and Sanchez 2017).

Comment. Present in a large part of the Italian Peninsula (Fanti 2014), this species has only recently been recorded from Switzerland, in Ticino (Kopetz and Duelli 2006). Since its first mention, the revision of additional museum material and the capture of some additional specimens have provided a more specific understanding of its distribution in the south of that canton. In France, this species is known exclusively from a few localities in the Maritime Alpes and the Var department (Constantin 2014a, c).

C12) *Malthodes* (*Malthodes*) *aemulus* Kiesenwetter, 1861

Examined material. 1 ex., Dalpe TI, 17.VI.–2.VII.1957, leg. Allenspach V., coll. Wittmer W., NMB; 3 ex., Valais, Laquintal, 26.VII.1963, leg. & coll. Scherler P., NMBE; 2 ex., Alpjen s. Gondo VS, VII.1971, leg. Toumayeff G., NMB & MHNG; 1 ex., Laggintal VS, VII.1971, leg.

Toumayeff G., MHNG; 1 ex., A. di Neggia TI, VII.1971, leg. Toumayeff G., MHNG; 4 ex., Tessin, S. Carlo (V. Bavona), 13.VII.1975, leg. Besuchet C., NMB & MHNG; 8 ex., Tessin, Mte. Boglia, 14.VII.1978, leg. & coll. Scherler P., NMBE; 1 ex., Laggintal VS, VII.1979, leg. Toumayeff G., coll. Wittmer W., NMB; 1 ex., Tessin, Brè, 11.VII.1980, leg. & coll. Scherler P., NMBE; 10 ex., Tessin, Mte Lema, 17.VII.1980, leg. Scherler P., coll. Wittmer W., NMB & NMBE; 5 ex., Tessin, Pne. di Breno, 17.VII.1980, leg. Scherler P., coll. Wittmer W., NMB & NMBE; 6 ex., Tessin, Mte. Gambarogno, 23.VII.1980, leg. & coll. Scherler P., NMBE; 1 ex., Mte. Boglia TI, 14.VI.1982, leg. & coll. Scherler P., NMBE; 1 ex., s. Vergeletto TI, 22.VII.1983, leg. & coll. Scherler P., NMBE; 4 ex., Grisons, Bregaglia, V. Bondasca, 19.VII.1984, leg. Besuchet C., MHNG & leg. & coll. Scherler P., NMBE; 13 ex., Tessin, Alpe Brogoldone, s/Claro, 17.VII.1990, leg. Besuchet C., MHNG; 3 ex., Molinera TI, 19.VII.1990, leg. & coll. Scherler P., NMBE; 1 ex., Ticino, Sigirino, Alpe Cusello, VII.1993, leg. & coll. Focarile A., MSNL; 2 ex., Simplon VS, 30.VI.2018, leg. & coll. Chittaro Y.; 2 ex., Zwischbergen VS, 1.VII.2018, leg. & coll. Chittaro Y.

Published data. [1,7)]Mt-Rose by Stierlin G. (Favre 1890); Ticino, Brissago and Sigirino by Focarile A., Ticino, Carì, 2003 by Liberti G. (Liberti 2011).

Comment. *Malthodes aemulus* inhabits the French Alps (the Maritime Alps until the Savoie, according to Constantin 2014a), as well as the Alps of Italy (Liberti 2011, 2015, Kahlen and Hellrigl 1996) and Switzerland. In Switzerland, it is limited to the southern slope of the Alps (South of Simplon in Valais, Tessin, South of Grisons).

C13) *Malthodes* (*Malthodes*) *bertolinii* Fiori, 1905

Examined material. 1 ex., Tessin, Generoso, Cragno, 4.VI.1969, leg. Besuchet C., MHNG; 1 ex., Tessin, Bruzella, 15.VII.1977, leg. & coll. Scherler P., NMBE; 1 ex., Tessin, Muggio, 22.VII.1980, leg. & coll. Scherler P., NMBE; 8 ex., Mt. Generoso TI, Bellavista, several dates between 1.VII.1982–1.VIII.1984, leg. Rezbanyai-Reser L., NMLU; 10 ex., Lugano TI, Mte Brè-Vetta, several dates between 21.VI.-20.VII.1983, leg. Rezbanyai-Reser L., NMLU; 1 ex., Riva S. Vitale TI, 4.VII.1984, leg. & coll. Scherler P., NMBE; 4 ex., Ticino, Tesserete, Gola di Lago, VI.1985, leg. & coll. Focarile A., MSNL; 11 ex., Casima TI, Südrand, several dates between 1.–30.VII.1988, leg. Rezbanyai-Reser L., NMLU; 6 ex., Lugano TI, Mte Brè-Ost, several dates between 11.VII.1984–10.VII.1986, leg. Rezbanyai-Reser L., NMLU; 10 ex., Somazzo TI, Torreta-O., several dates between 1.VII.1985–30.VII.1987, leg. Rezbanyai-Reser L. NMLU; 1 ex., s. Capolago TI, 5.VII.1986, leg. & coll. Scherler P., NMBE; 11 ex., Meride TI, San Antonio, several dates between 1.VII.1989–20.VII.1991, leg. Rezbanyai-Reser L., NMLU; 3 ex., Castel S. Pietro TI, Obino, Waldrand, several dates between 1.VII.1991–20.VI.1993, leg. Rezbanyai-Reser L., NMLU; 6 ex., Cragno TI, Pree, several dates between 11.VII.1994–20.VII.1996, leg. Rezbanyai-Reser L., NMLU; 1 ex., Mt. Generoso TI, Bellavista-Ost, 12.VII.1994, leg. Rezbanyai-Reser L., NMLU; 1 ex., Gandria TI, Scapi, 21.–30.VI.1991, leg. Rezbanyai-Reser L., NMLU.

Published data. Tessin, Generoso-Cragno, 4.VI.1969, leg. Besuchet C., MHNG (Wittmer 1971).

Comment. This is a species from the central and south-eastern Alps, only known from Italy (Kahlen and Hellrigl 1996, Fanti 2014, Liberti 2015) and Switzerland, where it is recorded exclusively from Ticino. The majority of the Swiss records have been made by L. Rezbanyai-Reser, using light traps. In some localities, this species co-occurs with its close relatives *M. alpicola* and *M. guttifer*.

C14) [*Malthodes* (*Malthodes*) *bifurcatus* Kiesenwetter, 1852]

Published data. [1,8)]1 ex., Sièrene GE [Sierne], MHNG (Allenspach and Wittmer 1979).

Comment. According to Allenspach and Wittmer (1979), there was a specimen of this species at MHNG. While there is a label and space dedicated to this species in the MHNG collection, no specimen was found there. The specimen cited by Allenspach and Wittmer (1979) probably turned out to be misidentified and has been moved to another species in the collection by V. Švihla in the years after 2000. Strangely, the only specimens from the same locality (Sierne) found at MNHG are all *M. spretus*. There may have been a confusion with that species. In any case, as already noted by Allenspach and Wittmer (1979), this species does not belong to the Swiss fauna, being endemic to Sicily (Fanti 2014) and Malta (Švihla and Mifsud 2006, Fanti 2014).

C15) [*Malthodes* (*Malthodes*) *boicus* Kiesenwetter, 1863]

Published data. [2)]1 ex., Meride TI, 30.VI.1983, [2)]1 ex., Rancate TI, 30.VI.1983 and [2)]2 ex., Riva San Vitale TI, 4.VII.1984 by Scherler P. (Scherler 1986).

Comment. For Switzerland, this species is only cited from three localities in Ticino by Scherler (1986). We were able to revise those specimens in Scherler's collection and all of them turned out to be misidentified *M. umbrosus*. Before the publication of detailed illustrations by Liberti (2016), it was easy to mistake *M. umbrosus* for *M. boicus*. Kahlen and Hellrigl (1996) and Liberti (2016) cite *M. boicus* from Italy, but only from a few localities in the north-east, far from the Swiss border. *Malthodes boicus* is also cited from Austria and a few localities in Germany, from Bavaria to Baden-Württemberg (Bretzendorfer 2017).

C16) *Malthodes* (*Malthodes*) *caudatus* J. Weise, 1892

Examined material. 3 ex., Cheville VD, coll. Bugnion E., NMB & MZL; 1 ex., Generoso, 27.VII., leg. Anonymous, MHNG; 1 ex., Pont de Nant, 14.VII.1940, leg. Demole W., MHNG; 1 ex., Tessin, Generoso, 12.VII.1961, leg. & coll. Scherler P., NMBE; 1 ex., Trogen, 7.VII.1963, leg.

Spälti A., MHNG; 1 ex., Les Haudères VS, 6.VIII.1980, leg. & coll. Scherler P., NMBE; 1 ex., Suisse, BE, Lenk, Hahnenmoos, VII.1983, leg. Toumayeff G., MHNG; 1 ex., CH, TI, Mt. Generoso, Vetta, Wald, 13.VII.1990, leg. Rezbanyai-Reser L., NMLU; 3 ex., CH, LU, Romoos, Neumatt, 21.-30.VI.1991, leg. Rezbanyai-Reser L., NMLU; 1 ex., CH, LU, Romoos, Neumatt, 1.–10.VI.1993, leg. Rezbanyai-Reser L., NMLU; 1 ex., Oberems VS, 4.VII.2013, leg. & coll. Chittaro Y.; 1 ex., Zermatt VS, 2.VII.2019, leg. & coll. Chittaro Y.

Published data. 2 ex., Waadt, Cheville (Pas de Cheville, Diablerets), coll. Bugnion E. and [1)]1 ex., Saxon, Erzgebirge, coll. Wittmer W., ex coll. Hicker R. (Wittmer 1970, 1971); [1)]Scatlè [Breil/Brigels GR], 2013 by Huber B. (Huber and Büche 2014); 3 ex., Romoos, Neumatt, 21.–30.VI.1991 and 1 ex., 1.–10.VI.1992 (Herger and Germann 2015).

Comment. Liberti (2015) considers this as a rare species from the Alps, present from France (where it was only recently recorded by Constantin 2014c) until the Czech Republic and Slovenia (Drovenik 2001). While also quite rare in Switzerland, there are scattered records from various parts of the Swiss Alps.

C17) *Malthodes* (*Malthodes*) *crassicornis* (Maeklin, 1846)

Examined material. [3,4,6)]1 ex., Helvetia, leg. Anonymous, NMB; 1 ex., T. [Chiasso, Tannino], 7.VI.1930, coll. Fontana P., MSNL.

Published data. [1)]"Schweiz" by K. (Bremi-Wolf 1856); [1)]Genf by Tournier H. and [1)]Schaffhausen by Stierlin G. (Stierlin and Gautard 1867); [1)]Valais by Stierlin G. (Favre 1890); [1)]Schweiz, leg. Rey, nach Kiesenwetter (1860) (Horion 1953).

Comment. All Swiss literature records of this species are very old and not verifiable, while the data of the old specimen deposited at NMB are too imprecise to be retained. The only more or less reliable record of this species in Switzerland is based on a specimen collected by P. Fontana in southern Ticino, in 1930, now deposited at MSNL (Fig. 2A–C). This specimen had already been seen by Wittmer, and we were now able to extract its aedeagus to confirm its identity beyond any doubt. The data labels in P. Fontana's collection can generally be regarded as reliable, so we are, at least provisionally, retaining this species on the Swiss list based on this single specimen. In a larger biogeographical context, the present record close to the Italian border is quite interesting, after all the records from Italy were considered doubtful and « pending confirmation » by Fanti (2014) and Liberti (2015). Though generally rare, this species from northern and central Europe is nonetheless known from south-western Germany, where Bretzendorfer (2017) even listed some recent verified records. It is therefore possible that *M. crassicornis* also occurs in the North of Switzerland. It would be important to confirm the occurrence of *M. crassicornis* in Switzerland through additional surveys in the future.

C18) *Malthodes* (*Malthodes*) *debilis debilis* Kiesenwetter, 1852

Examined material. 4 ex., Suisse, Tessin, Magadino, 16.VII.1969, leg. Scherler P., MHNG & leg. & coll. Scherler P., NMBE; 3 ex., Suisse, Tessin, Magadino, 30.VII.1974, leg. Scherler P., MHNG & leg. & coll. Scherler P., NMBE; 1 ex., CH, LU, Romoos, Neumatt, 11.-20.VII.1992, leg. Rezbanyai-Reser L., NMLU.

Published data. [1)]1 ex., Schaffhausen, DEI (Horion 1953); Magadino, 16.VII.1969 by Scherler P. (Wittmer 1971); [1)]Val Bavona, 2003 by Focarile A. (Focarile 2003); 1 ex.,Romoos, Neumatt, 11.–20.VII.1992 (Herger and Germann 2015).

Comment. Only a very small number of specimens from two localities confirm the occurrence of this species in Switzerland, where it appears to be rare. With more research in the future, it may well be discovered in other parts of Switzerland. Widely distributed within the Palaearctic Region, it is known from all the regions adjacent to Switzerland: Ain in France (Constantin 2014a); Baden in Germany (Bretzendorfer 2017); Vorarlberg in Austria (Brandstetter and Kapp 1998); northern Italy (Liberti 2015). With the assistance of Gianfranco Liberti, we were able to confirm that the taxon that occurs in Switzerland is the nominal subspecies and not the recently described subspecies *pedemontanus* Liberti, 2018. This taxon differs from the nominotypical form in the structure of the aedeagus and is known from a handful of specimens from Piedmont, Liguria, the northwestern Appenines and a single specimen from Calabria (Liberti and Poggi 2018).

C19) [*Malthodes* (*Malthodes*) *dimidiaticollis dimidiaticollis* (Rosenhauer, 1847)]

Published data. [1)]"Schweiz" (Bremi-Wolf 1856).

Comment. This species was included in the checklist of Swiss Coleoptera by Bremi-Wolf (1856) under the now synonymous name *Malthodes pulicarius* (Redtenbacher, 1849). Known from Central Europe and even from Turkey, Lebanon, Israel, Jordan and Kazakhstan, the species could not be confirmed for Italy (Fanti 2014), and the records from Germany are also dubious or at least very old (Köhler and Klausnitzer 1998). For Switzerland, only this single, old and imprecise literature citation is available. We therefore advise the removal of this species from the list of the Swiss fauna.

C20) *Malthodes* (*Malthodes*) *facetus* Kiesenwetter, 1863

Examined material. 1 ex., Bruzella TI, 15.VII.1977, leg. & coll. Scherler P., NMBE; 1 ex., Mte. San Giorgio TI, 10.VII.1978, leg. & coll. Scherler P., NMBE; 1 ex., Tessin, Besazio, 18.VII.1980, leg. & coll. Scherler P., NMBE; 9 ex., Suisse, Tessin, Mte San Giorgio, 14.VII.1980, leg. Scherler P., MHNG & leg. & coll. Scherler P., NMBE; 3 ex., Suisse, Tessin, Muggio,

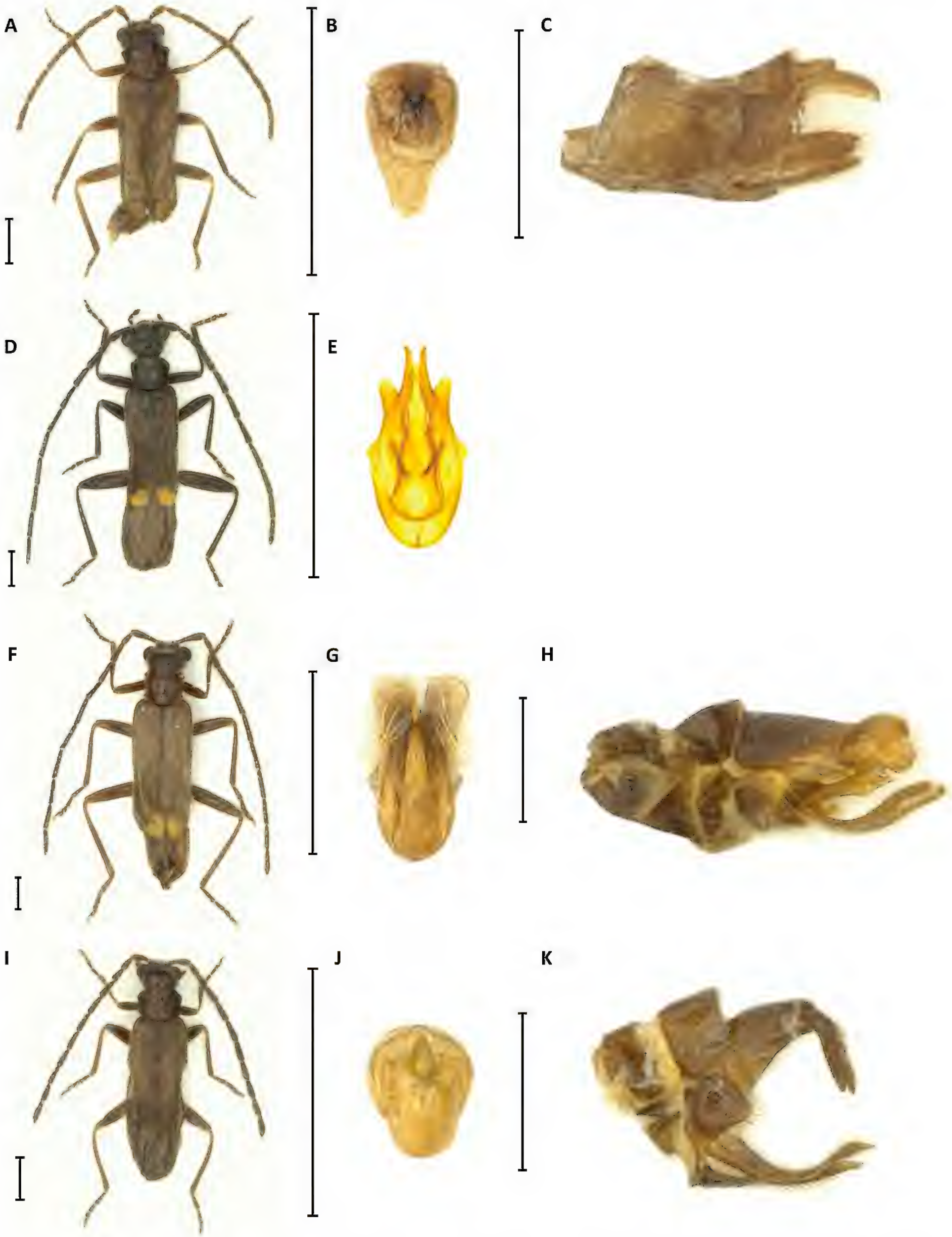

Figure 2. A) Habitus, **B)** aedeagus (dorsal view) and **C)** last abdominal segments (lateral view) of *Malthodes crassicornis* (Tannino, Chiasso); **D)** habitus and **E)** aedeagus (dorsal view) of *Malthodes kahleni* (Hasle, Entlebuch) (last abdominal segments damaged); **F)** habitus, **G)** aedeagus (dorsal view) and **H)** last abdominal segments (lateral view) of *Malthodes stolzi* (Bruzella); **I)** habitus, **J)** aedeagus (dorsal view) and **K)** last abdominal segments (lateral view) of *Malthodes umbrosus* (Riva S. Vitale). Scale bar: 0.5 mm. (Photos by Y. Chittaro).

22.VII.1980, leg. Scherler P., MHNG & leg. & coll. Scherler P., NMBE; 3 ex., Suisse, Tessin, Bruzzela, 26.VII.1980, leg. Scherler P., MHNG & leg. & coll. Scherler P., NMBE; 4 ex., Meride TI, 15.VI.1982, leg. & coll. Scherler P., NMBE; 3 ex., s. Capolago TI, 23.VI.1983, leg. & coll. Scherler P., NMBE; 4 ex., Meride TI, 30.VI.1983, leg. & coll. Scherler P., NMBE; 1 ex., Castel S. Pietro TI, 29.VI.1984, leg. & coll. Scherler P., NMBE; [8)]1 ex., Berne, Jochpass, 28.VII.1986, leg. & coll. Scherler P., NMBE; 2 ex., Arzo TI, 13.VI.1990, leg. & coll. Scherler P., NMBE; 1 ex., Melano TI, 19.VI.2019, leg. Guidotti G., coll. Chittaro Y.

Published data. 1 ex., Bruzella, 15.VII.1977, 1 ex., Monte San Giorgio, 10.VII.1978, 8 ex., Monte San Giorgio, 14.VII.1980, 2 ex., Besazio, 18.VII.1980, 2 ex., Muggio, 22.VII.1980 and 2 ex., Bruzella, 26.VII.1980 by Scherler P. (Scherler 1981).

Comment. Reported as new to Switzerland by Scherler (1981), based on several records from Ticino, this species also exists in the southeast of France (Var, Alpes-Maritimes, Alpes-de-Haute-Provence, see Constantin 2014a), as well as northern and central-western Italy (Liberti 2011, 2015). After its discovery in Switzerland, several more yet unpublished records from southern Ticino, mainly made by Pierre Scherler, have helped to provide more detail about its distribution within the country. Considering its overall distribution, we strongly suspect that the single specimen labelled as coming from North of the Alps (Jochpass, Bern) is mislabelled.

C21) *Malthodes* (*Malthodes*) *fibulatus* Kiesenwetter, 1852

Examined material. 1 ex., Zürich Umgb., Killwangen, 22.V.1941, leg. Wolf J.-P., MHNG; 2 ex., Waldegg ZH, 29.IV.1943, leg. & coll. Allenspach V., NMB; 1 ex., Schaffhausen SH, 10.V.2020, leg. Kessler D., coll. Chittaro Y.

Published data. [2)]Strada, S., 23.V.1961 by Handschin E. (Handschin 1963); [1)]Schaffhausen, coll. Stierlin G., DEI, [2)]Yvonand VD, 16.V.1952, leg. Besuchet C., MZL; [2)]Sierre, coll. Bugnion E., MZL and Waldegg ZH, 29.IV.1948, leg. Allenspach V. (Wittmer 1970); [1)]1 ex., Mt. Jorat VD, MZL (Allenspach and Wittmer 1979); [2)]1 ex., Romoos, Neumatt, 11.–20.VI.1992 (Herger and Germann 2015).

Comment. This species is found in almost all of Europe, from Scandinavia to Italy and from France to Poland (Liberti 2015). A few scattered data confirm its presence in Switzerland, where it seems to be scarce. Some of the citations of this species in the Swiss literature have however turned out to be based on misidentified specimens (the specimen from Romoos LU turned out to belong to *M. maurus*, the one from Strada GR is *M. misellus*, the one from Sierre VS is *M. europaeus*).

C22) *Malthodes* (*Malthodes*) *holdhausi* Kaszab, 1955

Examined material. 2 ex., Schweiz, AG, Untersiggenthal, Iflue, 21.V.1998, leg. Walter T., MHNG & NMB; 4 ex., Schaffhausen SH, 7.V.2009, 7.VI.2009, leg. & coll. Pankow W.; 1 ex., Schaffhausen SH, 13.V.2009, leg. & coll. Pankow W.

Published data. 5 ex., Untersiggenthal, 21.V.1998 by Walter T. & Weber P. (Walter and Weber 1999).

Comment. Only recently recorded from Switzerland from a single locality in the canton of Aargau (Walter and Weber 1999), this species was later found in the canton of Schaffhausen, from where F. Bretzendorfer identified a number of specimens collected by W. Pankow. Most likely, this species is only present in the northern part of the country. It is also known from the South-West of Germany (Bretzendorfer 2017), Austria, Czech Republic, Hungary, Romania and Slovakia (Kazantsev and Brancucci 2007).

C23) *Malthodes* (*Malthodes*) *icaricus* Wittmer, 1940

Examined material. 1 ex., Terre di Pedemonte TI, Cavigliano, 21.IV.2015, leg. & coll. Chittaro Y.

Published data. [2)]Berninapass, 6.VIII.1896, Albulapass, 30.VII.1908 (Wittmer 1970, 1971); [2)]Hohtälli, 12.VIII.1982 by Besuchet C. (Besuchet 1983).

Comment. *M. icaricus* was only recently elevated to full species rank by Liberti (2015), having been treated as a subspecies of *M. penninus* before. The entirety of the specimens found identified in collections (mainly by W. Wittmer) as *M. penninus icaricus* turned out to in fact belong to the high-altitude morph of *M. penninus* (after Liberti 2015) after closer scrutiny. At this moment, only a single specimen collected in Ticino at Cavigliano in 2015 can be attributed to *M. icaricus*, confirmed by G. Liberti. The specimen was collected in a flight intercept trap at an altitude of 600 m. There are also records from Austria and several parts of Italy: Prealps of Piedmont, Lombardy and Trentino (Liberti 2015) and South Tyrol / Alto Adige (Kahlen and Hellrigl 1996).

C24) *Malthodes* (*Malthodes*) *kahleni* Wittmer, 1982

Examined material. 1 ex., Hasle im Entlebuch, Entlen-Ufer, 20.VII.1990, leg. Kiener S., NMBE.

Published data. 1 ex., Hasle im Entlebuch, 20.VI.1990 by Kiener S. (Kiener 1995).

Comment. The type locality of this species, described by Wittmer (1982) is Stams in Tyrol, Austria. Liberti (2016) indicates that this could be a very rare relict species, distributed across a vast area including at least Central Europe, the East Alps and the Pyrenees. It was only recently recorded from Italy, from Amaro in Udine province (Kahlen 2010). Liberti (2016) also cites localities in Czech Republic and Spain, while Kazantsev and Brancucci (2007) also list it from Austria and Slovakia. This species is also present in Switzerland: one specimen (Fig. 2D, E), from the canton of Lucerne, was collected by S. Kiener in 1990 and identified by W. Wittmer. Kiener (1995) simply indicated that his specimen was found in an "Auengebiet" (riparian woodland), same as the type material, which led him to suppose that this species may be restricted to that kind of habitat.

C25) [*Malthodes* (*Malthodes*) *montanus* Kiesenwetter, 1863]

Published data. [2)]Saas-Almagell, VII.1942 by Lautner J.; [2)]Schuls, VI.1938 by Toumayeff G. (Linder 1968); [1)]Scuol, Innufer, 31.V.1953 by Handschin E. (Handschin 1963); [1)]Jonschwil, Lee, am Tümpel, VII.1960 by Hugentobler H. (Hugentobler 1966); [2)]Poschiavo [Val Poschiavo] by Jörger J.B. (Linder 1967); [2)]Bissone, Lugano by Lautner J. and [2)]8 ex., Büren a/Aare BE, VI.1894, NMBE (Allenspach and Wittmer 1979); [2)]1 ex., Romoos, Neumatt, 1.-10.VI.1993 (Herger and Germann 2015).

Comment. Liberti (2016) treats this as a species limited to the eastern Alps, from north-eastern Italy to Austria and Slovenia. It is also recorded from Germany (Bavaria and Weser-Ems region, historically also from Nordrhein, according to Köhler and Klausnitzer 1998), Belgium and Hungary (Kazantsev and Brancucci 2007). For Switzerland, all of the literature citations turned out to be misidentifications (confusions with *M. spathifer* in case of the specimens from Schuls and Büren, with *M. cyphonurus* for those from Poschiavo and Bissone and with *M. hexacanthus* for that from Romoos), after the study of the relevant material. Based on the currently available data, this species does not occur in Switzerland.

C26) *Malthodes* (*Malthodes*) *penninus raeticus* Wittmer, 1970

Examined material. 2 ex., Vals, VIII.1909, leg. Jörger J.B., coll. Wittmer W., NMB.

Published data. Vals, Graubünden, 31.VIII.1909, ex coll. Jörger J.B., holotype and paratype NMB (Wittmer 1970, 1971).

Comment. This subspecies of *M. penninus* is hitherto only known from the holotype and a single paratype, both collected by Jörger J.B. in Vals, in the canton of Grisons. Its taxonomic status needs to be critically examined.

C27) *Malthodes* (*Malthodes*) *siculus* Kiesenwetter, 1852

Examined material. 1 ex., Vaud, Prangins, 17.V.1956, leg. Besuchet C., MZL; 2 ex., Buchillon VD, 21.V.1956, leg. Besuchet C., NMB & MHNG; 3 ex., Suisse, Vaud, Buchillon, 29.5.1956, leg. Besuchet C., MZL; 1 ex., Vaud, La Sarraz, 19.V.1968, leg. & coll. Scherler P., NMBE; 1 ex., Eclépens VD, V.1972, leg. Toumayeff G., MHNG; 1 ex., Vaud, Bretonnières, 14.V.1972, leg. & coll. Scherler P., NMBE; 4 ex., Suisse, Vaud, Mormont, 14.V.1972, leg. Scherler P., MHNG & leg. & coll. Scherler P., NMBE; 1 ex., Vaud, Pompaples, 22.V.1976, leg. & coll. Scherler P., NMBE; 4 ex., Vaud, Moiry, 30.V.1982, leg. & coll. Scherler P., NMBE; 4 ex., Vaud, s. L'Isle, 29.V.1983, leg. & coll. Scherler P., NMBE; 1 ex., Vaud, Moiry, moitié NO de la réserve à partir de la route Moiry-Envy, 11.VII.1985, leg. Scherler P., MZL; 4 ex., Vaud, Ferreyres, 25.V.1986, leg. & coll. Scherler P., NMBE; 4 ex., Orny VD, V.1989, leg. Toumayeff G., MHNG; 1 ex., La Sarraz VD, 9.V.2017, leg. & coll. Chittaro Y.

Published data. Buchillon (Vaud), 29.V.1956 by Besuchet C. and La Sarraz (Vaud), 19.V.1968 by Scherler P. (Wittmer 1970, 1971); Bois de Chênes, Ferreyres-Moiry, 25.V.1985, 11.VII.1985 by Scherler P. (Scherler et al. 1989).

Comment. This species is widely distributed in Italy, most notably in the Centre and South of the country (Fanti 2014, Liberti 2015), but also present in a few localities in France (Constantin 2014a), as well as western Switzerland.

C28) *Malthodes* (*Malthodes*) *stolzi* Hicker, 1915

Examined material. 1 ex., Tessin, Bruzella, 26.7.1980, leg. & coll. Scherler P., NMBE.

Published data. 1 ex., Bruzella, 26.7.1980 by Scherler P. (Scherler 1981).

Comment. This species was recorded as new to Switzerland by Scherler (1981), based on a single specimen (Fig. 2F–H) from the Val Muggio, Ticino, which was verified by W. Wittmer. We were able to find the respective voucher specimen in Scherler's collection and confirm its identity. *M. stolzi* has been considered a rare endemic of the Bergamasque Prealps, only known from a small area on the southern slope of Mt. Menna, near Oltre il Colle (Fanti 2014, Liberti 2015). The single known Swiss locality in southern Ticino, 50 km apart from the type locality, therefore considerably extends the known range of this species. Scherler (1981) indicated that the Swiss locality lies at 700 m altitude and that it was collected « in a sparse chestnut woodland with grassy and bushy undergrowth ».

C29) *Malthodes* (*Malthodes*) *umbrosus* Kiesenwetter, 1871

Examined material. 2 ex., Meride TI, 30.VI.1983, leg. & coll. Scherler P., NMBE; 1 ex., Rancate TI, 30.VI.1983, leg. & coll. Scherler P., NMBE; 3 ex., Suisse, TI, Riva San Vitale, 4.VII.1984, leg. Scherler P., MHNG & leg. & coll. Scherler P., NMBE; 1 ex., Suisse, Tessin, Lago d'Origlio, 24.VI.1987, leg. Besuchet C., MHNG; 3 ex., Meride TI, San Antonio, 11.–20.VII.1991, leg. Reser L., NMLU.

Comment. Some specimens from southern Ticino allow us to record this species as new to Switzerland here. The three specimens from 1991 were collected at a light trap, while those from 1987 were found « under bark of an alder trunk ». The specimens from 1983 and 1984 (Fig. 2I–K) were erroneously recorded as *M. boicus* by Scherler (1986), but turned out to belong to *M. umbrosus*.

C30) *Malthodes* (*Malthodes*) *vincens* Gredler, 1870

Examined material. 1 ex., CH, TI, Mte Generoso, Bellavista, IX.1982, leg. Rezbanyai-Reser L., MHNG; 2 ex., Mt. Generoso TI, Bellavista, 1.–10.IX.1982, leg. Rezbanyai-Reser L., NMLU; 1 ex., Mt. Generoso TI, Bellavista, 1.–10.IX.1983, leg. Rezbanyai-Reser L., NMLU;

2 ex., Mt. Generoso TI, Bellavista, 21.–30.IX.1983, leg. Rezbanyai-Reser L., NMLU; 1 ex., Mt. Generoso TI, Bellavista, 21.–30.IX.1984, leg. Rezbanyai-Reser L., NMLU; 1 ex., Cragno TI, Pree [Salorino], 1.–10.X.1995, leg. Rezbanyai-Reser L., NMLU; 1 ex., Cragno TI, Pree [Salorino], 11.–20.X.1995, leg. Rezbanyai-Reser L., NMLU; 2 ex., Meride, Serpiano TI, Wald, 1.–10.X.1995, leg. Rezbanyai-Reser L., NMLU; 1 ex., CH, TI, Mte Generoso, Valle d. Giascia, Zoca, 2.X.1995, leg. Rezbanyai-Reser L., MHNG; 1 ex., Cragno TI, Pree [Salorino], 1.–10.X.1996, leg. Rezbanyai-Reser L., NMLU; 1 ex., Meride, Serpiano TI, Wald, 11.–20.IX.1997, leg. Rezbanyai-Reser L., NMLU.

Published data. 2 ex., Brusio Arsizio, Serpiano, 1.–10.X.1995 and 1 ex., 11.–20.IX.1997 (Herger et al. 2015).

Comment. This phenologically late species has a scattered distribution across the central and eastern Italian Alps and into Austria and Slovenia (Kahlen and Hellrigl 1996, Liberti 2016), as well as the Swiss canton Ticino. The closely related sister species *M. fiorii* Ganglbauer, 1906 replaces *M. vincens* in Liguria and the Maritime Alps (Liberti 2016). This species was firstly recorded from Switzerland by Herger et al. (2015), based on specimens collected in a light trap and deposited at NMLU. Here, we can add a few more records collected earlier, based on specimens at MHNG and NMLU. All of the specimens were collected by the lepidopterist L. Rezbanyai-Reser at light traps.

C31) [*Autosilis nitidula* (Fabricius, 1792)]

Examined material. [3,4,6)]2 ex., Schweiz, leg. Anonymous, NMB; [3,4,7)]1 ex., Suisse, Macugnaga [IT] coll. Maerky C., MHNG.

Published data. [1)]"Schweiz" by Stierlin G. (Bremi-Wolf 1856); [1,7)]Macugnaga by Stabile G. (Stierlin and Gautard 1867).

Comment. The data available to us are insufficient to retain this species as part of the Swiss fauna. Only two specimens, labelled simply "Schweiz" [Switzerland], without precise localities, exist in Swiss collections. Regarding the record from "Macugnaga", a locality also cited in the Swiss literature, we have to point out that this is located in Italy, close to the Swiss border, but not in Switzerland! Additionally, the label data in the collection to which those specimens belong to (coll. C. Maerky) have often proven to be unreliable (Monnerat et al. 2015). Despite being widely distributed in central, northern and eastern Europe, including parts of Italy (Monte Rosa area and Carnian Alps, according to Fanti 2014), this species doesn't appear (yet) to be part of the Swiss fauna.

Discussion

This commented list on the Swiss Cantharidae and Lycidae is in keeping with other syntheses on various beetle families published in the past years (see for example Chittaro and Sanchez 2019a, b; Sanchez et al. 2020). It thus improves the overall understanding of Swiss fauna. Thanks to the distribution maps based on the collected data (available on the info fauna – CSCF cartographic server, www.cscf.ch), this work provides a thorough faunistic overview of the current understanding of the species of Cantharidae and Lycidae.

Cantharidae (100) and Lycidae (6) are represented by 106 species in Switzerland. Compared to the previous national list (Allenspach and Wittmer 1979), several species have been added (*Cantharis fibulata*, *C. liburnica*, *C. paradoxa*, *Malthinus rubricollis*, *M. sordidus*, *Malthodes facetus*, *M. holdhausi*, *M. kahleni*, *M. stolzi*, *M. umbrosus*, *M. vincens*, *Rhagonycha pedemontana*), while one has been removed (*Malthodes montanus*). Another species recorded later on by Scherler (1986), *M. boicus*, has also been deleted from the Swiss checklist. The species added since Allenspach and Wittmer (1979) were mostly possible thanks to more intense surveying that lead to the discovery of more taxa, although in a few cases they were the result of species being "split", i.e. taxa that were initially understood to be single species were later recognised as a group of cryptic species (e.g. Švihla 2006). Additionally, we are now able to provide additional data for some species only known from a small handful of data points at the time of Allenspach and Wittmer (1979), e.g. *Malthodes bertolinii* and *M. setifer*, thanks to numerous surveys conducted during the past 40 years.

While our knowledge on the distribution of Cantharidae and Lycidae in Switzerland is based on a solid foundation of data and can be considered solid, at least compared to other countries, there are nevertheless a number of species in urgent need of additional documentation. This is particularly the case for some *Malthodes*, *Malthinus* and *Rhagonycha*, where reliable identifications are only possible through the examination of the male terminalia, while the females are often impossible to identify with any certainty.

Targeted sampling of certain species or species groups in the future, while systematically extracting the genitalia of those specimens where necessary, is still likely to add some new discoveries to our fauna, as exemplified by the new country records of *Cantharis paradoxa* and *Malthodes umbrosus* in the present paper. Several species present in areas adjacent to Switzerland could be added in the future, most notable in the Ticino. For example, *Malthodes tetraglyphis* Hicker, 1953 and *M. caudatomimicus* Wittmer, 1970 are present in northern Italy not far from the Swiss border (Liberti 2015). *Ancistronycha occipitalis*, present in southwestern Germany (Bretzendorfer 2017), could easily also occur in northern Switzerland. It is also not impossible that there could be undescribed cryptic species or subspecies currently mixed up with known Swiss species. Hendrich et al. (2015) showed the existence of multiple distinct genetic lineages within what is currently considered a single species of Cantharidae (in *Cantharis terminata*, *C. tristis* and *Malthodes mysticus*), based on their study on mitochondrial DNA. The above paper also managed to confirm that many closely related cantharid species, distinguished only by

their genitalia and currently indistinguishable by external characters, are indeed genetically separate species. As for Lycidae, *Benibotarus taygetanus* Pic, 1905 is a species which could be discovered in Switzerland in the future, being present in Alsace (Callot 2001, Callot et al. 2010).

While adult cantharids are rather easily encountered when sweeping herbaceous vegetation, beating trees and shrubs, or searching on umbellifer flowers, our knowledge on the larval ecology of Swiss Cantharidae and Lycidae is still extremely fragmentary, and often completely lacking (Allenspach and Wittmer 1979). As a general rule, around half of the Cantharidae and the whole of Lycidae have been considered saproxylic, at least according to data from France (Bouget et al. 2019). Saproxylic Cantharidae are mainly within the genera *Malthinus* and *Malthodes*, whose larvae are predators inside rotting wood (Koch 1989), while the larvae of the other Cantharidae genera are active predators in the soil and in leaf litter (Constantin 2014a).

From a conservation point of view, it can be said that Switzerland harbors a number of species considered rare at a European or global scale (e.g. *Malthodes kahleni*), despite not having any strictly endemic taxa (with the possible exception of *Malthodes penninus raeticus*, whose taxonomic status requires further study). A number of the species found in Ticino, while only marginally distributed in Switzerland, have limited overall ranges, such as *Malthodes bertolinii*, *M. vincens* and, even more so, *M. stolzi*. Unfortunately, the life history and habitat requirements of many species, particularly in the genus *Malthodes*, are very much unknown, making it impossible to make an accurate assessment of their conservation status and highlighting particularly endangered species. Due to their small body size, short adult lifespan and difficult identification, it is easily possible that some "rare" *Malthodes* species are simply being overlooked, in Switzerland and elsewhere, and might not be as rare as currently thought. On the other hand, there is a risk that some of those species could "silently" be moving towards extinction while our knowledge about them is still not sufficient to even notice their decline, let alone plan appropriate conservation measures.

Unlike other families of Coleoptera, Cantharidae and Lycidae don't seem to contain any highly specialised alpine endemics within the borders of Switzerland, even though there are some in adjacent countries, e.g. the apterous local endemic *Podistra rupicola* Kiesenwetter, 1863 in Austria (Carinthia) and adjacent Slovenia. A number of Swiss cantharid species are restricted to higher altitudes, though often covering a relatively wide altitudinal range from the sub-alpine conifer forest zone up until the edge of alpine scree slopes and glaciers (e.g. *Cantharis tristis*, *Cratosilis distinguenda*, *Malthodes trifurcatus*, *M. penninus*, *Rhagonycha nigripes*). Most of these species have relatively wide ranges within the Alps, with some even occurring in other high mountain ranges of Europe. All of those species have winged adults, at least for the males. Brachypterous females do, however, occur at least in higher altitude populations of *Malthodes trifurcatus*, *M. penninus* and *M. caudatus* group. Apterous females are common in *Malthodes lobatus*, but this is a species of low altitudes.

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Supplementary material 1

File S1

Authors: Yannick Chittaro, Andreas Sanchez, Michael Geiser

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